WHAT IS CLAIMED IS:

1. An illumination apparatus for projecting a line of light, comprising;

a plurality of diode-lasers each thereof having an emitting-aperture and arranged in an elongated linear array thereof, said diode-lasers being spaced apart by a spacing defined as the distance between the centers of adjacent ones thereof;

said linear diode-laser array having a slow axis parallel to the length direction thereof, and a fast axis perpendicular to said slow axis, light being emitted from each of said diode-lasers, from an emitting aperture thereof, as a beam including diverging rays in both said fast and slow axes, in a general direction of propagation mutually perpendicular to both said fast and slow axes;

an optical system, said optical system having a longitudinal axis parallel to the propagation direction of light from said diode-lasers and having mutually perpendicular fast and slow axes corresponding to said fast and slow axes of said diode-lasers;

said optical system having a plurality of components including a first lens having positive optical power in said fast axis and zero optical power in said slow axis, a linear array of cylindrical microlenses, one corresponding to each of said diode-lasers, said microlenses having a slow-axis spacing equal to the spacing of said diode-lasers in said diode-laser array, each microlens having positive optical power in said slow axis and zero optical power in said fast axis, and said microlens array having a front focal plane and a back focal plane;

said microlens array being located at a distance from said emitters of said diode-lasers greater than the focal length of lenses in said microlens array but sufficiently closes to said emitters of said diode-lasers that each microlens receives light from only a said diode-laser corresponding thereto; and

wherein said optical system components are selected and arranged to form overlapping elongated images in a predetermined plane, said images being elongated images of cross-sections of said beams from said diode-lasers at a plane corresponding to said front focal plane of said microlens array.

2. The apparatus of claim 1, wherein said optical system components further include a second lens having negative optical power in said fast axis and zero optical power in said slow axis, a third lens having positive optical power in both said slow axis and said fast axis, said third lens having a front focal plane and a back focal plane, and a fourth lens having positive optical power in said fast axis and zero optical power in said slow axis, said optical components being listed in order of location along the direction of propagation of light from the diode-lasers.

3. The apparatus of claim 1, wherein said components of said optical system are arranged to focus said fast axis rays in said back focal plane of said positive lens, said front focal plane of said third lens is aligned with said back focal plane of said microlens array and said predetermined plane of said images is said back focal plane of said third lens.

4. An illumination apparatus for projecting a line of light, comprising;

a plurality of diode-lasers each thereof having an emitting-aperture and arranged in an elongated linear array thereof, said diode-lasers being spaced apart by a spacing defined as the distance between the centers of adjacent ones thereof;

said linear diode-laser array having a slow axis parallel to the length direction thereof, and a fast axis perpendicular to said slow axis, light being emitted from each of said diode-lasers, from an emitting aperture thereof, as a beam including diverging rays in both said fast and slow axes, in a general direction of propagation mutually perpendicular to both said fast and slow axes;

an optical system, said optical system having a longitudinal axis parallel to the propagation direction of light from said diode-lasers and having mutually perpendicular fast and slow axes corresponding to said fast and slow axes of said diode-;

said optical system having components including a first lens having positive optical power in said fast axis and zero optical power in said slow axis, a linear array of cylindrical microlenses, one corresponding to each of said diode-lasers, said

microlenses having a slow-axis spacing equal to the spacing of said diode-lasers in said diode-laser array, each microlens having positive optical power in said slow axis and zero optical power in said fast axis, and said microlens array having a front focal plane and a back focal plane;

said optical system components further including a second lens having negative optical power in said fast axis and zero optical power in said slow axis, a third lens having positive optical power in both said slow axis and said fast axis, said third lens having a front focal plane and a back focal plane, and a fourth lens having positive optical power in said fast axis and zero optical power in said slow axis, said optical components being listed in order of location along the direction of propagation of light from the diode-lasers;

said microlens array being located at a distance from said emitters of said diode-lasers greater than the focal length of lenses in said microlens array but sufficiently closes to said emitters of said diode-lasers that each microlens receives light from only a said diode-laser corresponding thereto;

said optical components of said optical system arranged to focus said fast axis rays in said back focal plane of said positive lens; and

said front focal plane of said third lens being aligned with said back focal plane of said microlens array, whereby said optical components form overlapping elongated images in said back focal plane of said third lens, said images being elongated images of cross-sections of said beams from said diode-lasers at a plane corresponding to said front focal plane of said microlens array.

5. The apparatus of claim 4, wherein said first lens has a convex front surface and a plane back surface, said second lens has a concave front surface and a plane back surface, said third lens has equal optical power in said slow axis and said fast axis and said fourth lens having a convex front surface and a plane rear surface.

6. The apparatus of claim 5, wherein any one of said concave and convex surfaces has an aspheric curvature.

7. The apparatus of claim 4 wherein any one of said first, second, third, and fourth lenses includes more than one lens element.

8. The apparatus of claim 7, wherein said third lens is a cemented doublet lens including first and second lens elements.

9. The apparatus of claim 8, wherein any surface of said third lens has an aspheric curvature.

10. The apparatus of claim 4, wherein said first lens is arranged to collimate fast axis rays received from said diode-lasers.

11. The apparatus of claim 4, wherein each of the microlenses in the microlens array has the same slow-axis optical power.

12. A method for projecting a line of light, comprising;

(a) providing an illumination apparatus including a plurality of diode-lasers each thereof having an emitting-aperture and arranged in an elongated linear array thereof, said diode-lasers being spaced apart by a spacing defined as the distance between the centers of adjacent ones thereof said linear diode-laser array having a slow axis parallel to the length direction thereof, and a fast axis perpendicular to said slow axis, light being emitted from each of said diode-lasers, from an emitting aperture thereof, as a beam including diverging rays in both said fast and slow axes, in a general direction of propagation mutually perpendicular to both said fast and slow axes;

(b) providing an optical system, said optical system having a longitudinal axis parallel to the propagation direction of light from said diode-lasers and having mutually perpendicular fast and slow axes corresponding to said fast and slow axes of said diode-lasers, said optical system having components including a first lens having positive optical power in said fast axis and zero optical power in said slow axis, a linear array of cylindrical microlenses, one corresponding to each of said diode-lasers, said microlenses having a slow-axis spacing equal to the spacing of said diode-lasers in said diode-laser array, each microlens having positive optical power in said slow axis and zero optical power in said fast axis, and said microlens array having a front focal plane and a back focal plane, said optical system components further including a second lens having negative optical power in said fast axis and zero optical power in said slow axis, a third lens having positive optical power in both said slow axis and said fast axis, said third lens having a front focal plane and a back focal plane, and a fourth lens having positive optical power in said fast axis and zero optical power in said slow axis, said optical components being listed in order of location along the direction of propagation of light from the diode-lasers, said microlens array being located at a distance from said emitters of said diode-lasers greater than the focal length of lenses in said microlens array but sufficiently closes to said emitters of said diode-lasers that each microlens receives light from only a said diode-laser corresponding thereto;

(c) spacing said first lens at distance from said emitting apertures of said diode-lasers such that said fast-axis rays are collimated thereby;

(d) arranging said optical components of said optical system to focus said fast axis rays in said back focal plane of said third lens;

(e) aligning said front focal plane of said third lens with said back focal plane of said microlens array, whereby said optical components form overlapping elongated images in said back focal plane of said third lens, said images providing the line of light and being elongated images of cross-sections of said beams from said diode-lasers at a plane in said beams corresponding to said front focal plane of said microlens array; and

(f) while maintaining the spacing between said first lens and said emitting apertures of said diode-lasers, varying the spacing between said first lens and said microlens array to optimize uniformity of illumination in the projected line of light.

13. A method for projecting a line of light from a diode-laser array, said array including a plurality of diode-lasers each thereof having an emitting-aperture wherein light is emitted along a slow axis parallel to the length direction of the array and a fast axis perpendicular to said slow axis comprising the steps of:

(a) locating a microlens at a distance the said emitting apertures of the diode-lasers greater than the focal length of lenses in said microlens array but sufficiently close to the emitting apertures of the diode-lasers that each microlens receives light from only one of a said diode-lasers;

(b) collimating the light emitted along the fast axis with a cylindrical lens;

(c) focusing the light emitted along the slow axis with said microlens array;

(d) following step (b) diverging the light in the fast axis with a cylindrical lens;

(e) following steps (c) and (d) collimating the light in the slow axis and focusing the light in the fast axis with a lens assembly in order to project a line of light having a length in the slow axis and a height in the fast axis and wherein steps (b), (c), (d), and (e) are performed on the light emitted from each diode-laser in the diode-laser.